1999–2000 CATS ASSESSMENT
Open-Response Item Scoring Worksheet

Grade 8 – Mathematics

The **academic expectations** addressed by the open-response item "Olympic 200-Meter Times" are:

1.5-1.9 Students use mathematical ideas and procedures to communicate, reason, and solve problems.

2.11 Students understand mathematical change concepts and use them appropriately and accurately.

2.12 Students understand and appropriately use statistics and probability.

The **core content** addressed by this item includes:

MA-M-3.2.5 Probability/Statistics (Skills): Make predictions and draw conclusions from statistical data and probability experiments.

MA-M-4.3.1 Algebraic Ideas (Relationships): How everyday situations, tables, graphs, patterns, verbal rules, and equations relate to each other.

MA-M-4.2.5 Algebraic Ideas (Skills): Represent and use functions through tables, graphs, verbal rules, and equations.

Olympic 200-Meter Times

Use the table below to answer the question.

Olympic 200-Meter Backstroke

YEAR	TIME	COUNTRY
1968	2:24	United States
1972	2:19	United States
1976	2:13	E. Germany
1980	2:11	E. Germany
1984	2:12	Netherlands
1988	2:09	Hungary
1992	2:07	Hungary
1996	2:08	Hungary

The women's 200-meter backstroke is one event of the summer Olympics, which are held every four years. The table above shows the winning times (in minutes and seconds) of the event since 1968.

a. Graph the numeric data from the table on the grid provided in your Student Response Booklet.

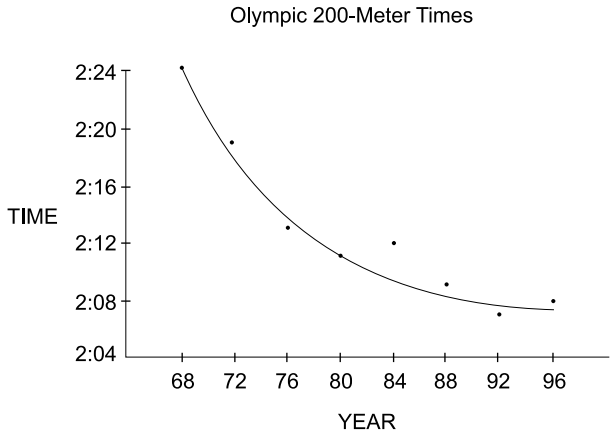
b. Describe the trend that is displayed by the graph.

c. Based on the data and your graph, predict a reasonable winning time for the women's 200-meter backstroke in the year 2000. Explain your reasoning.

SCORING GUIDE
Grade 8 Mathematics

Score	Description
4	Student scores 4 total points.
3	Student scores 3 to 3.5 points.
2	Student scores 1.5 to 2.5 points.
1	Student scores .5 to 1 point. **OR** Student shows minimal understanding.
0	Response is totally incorrect or irrelevant.
Blank	No response.

Correct answers



part a

2 points Correctly formatted graph (scales and labels) with correctly plotted points.

OR

1 point Correctly formatted (scales) with more than half of the points plotted correctly.

part b

1 point The times, in general, continue to decrease.

OR

.5 point Student just states that time decreases or lessens.

part c

1 point 2:06-2:08 minutes (by estimating from the graph)

Explanation: The pattern of points is flattening out.

OR

.5 point Correct prediction with limited or no explanation.

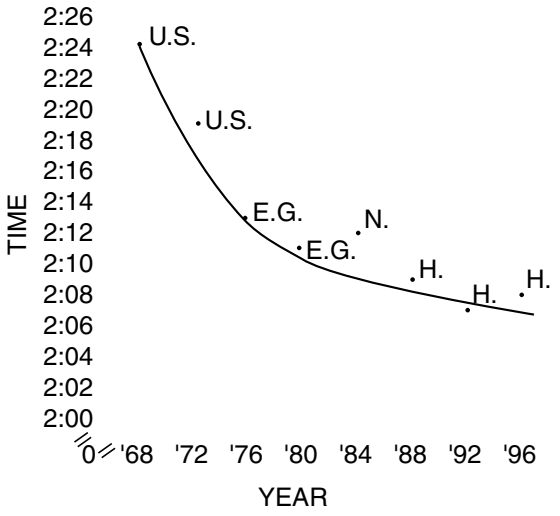
Note: Bar graph or scatterplot is acceptable. Line graph is not acceptable at the "4" level.

ANNOTATED STUDENT RESPONSE
Grade 8 Mathematics

Sample Student Response Scored a 4

Student Response

a.



b. The times dropped rapidly at first but less rapidly as time went on but still generally slopes downward.

c. A reasonable winning time for the year 2000 is 2:06, because the times are dropping if at all only by a few seconds each Olympics but don't go up as they drop. Also the data follows a general curve illustrated in pink on the graph that seems to indicate approximately this time for the year 2000.

← Student correctly graphs the numeric data. Graph is correctly formatted (scales and labels) and all points are correctly plotted. (2 points)

← Student correctly describes the trend that is displayed by the graph (i.e., "The times dropped rapidly at first but less rapidly as time went on … generally slopes downward"). (1 point)

← Student correctly predicts a reasonable winning time of 2:06 and supports the prediction by correctly explaining that "the times are dropping if at all only by a few seconds." (1 point)

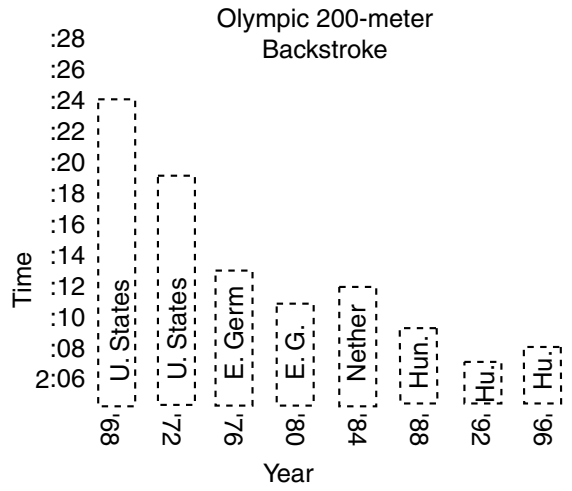
Overall, the student earns 4 points, demonstrating a strong understanding of graphing and the relationship between different representations of data (i.e., tables and graphs), as well as a strong ability to use the different representations of data to make a prediction.

ANNOTATED STUDENT RESPONSE
Grade 8 Mathematics

Sample Student Response Scored a 4

Student Response

A



B The pattern on the graph is that while the years went up the times usually went down.

C In the year 2000 I think the winning time may be about 2:06 because towards the end of the chart the times were only a second away from each other.

← Student correctly graphs the numeric data using a bar graph. Graph is correctly formatted (scales and labels). (2 points)

← Student correctly describes the trend that is displayed by the graph (i.e., "the times usually went down"). (1 point)

← Student correctly predicts a reasonable winning time of 2:06 and supports the prediction by correctly explaining that "towards the end of the chart the times were only a second away from each other." (1 point)

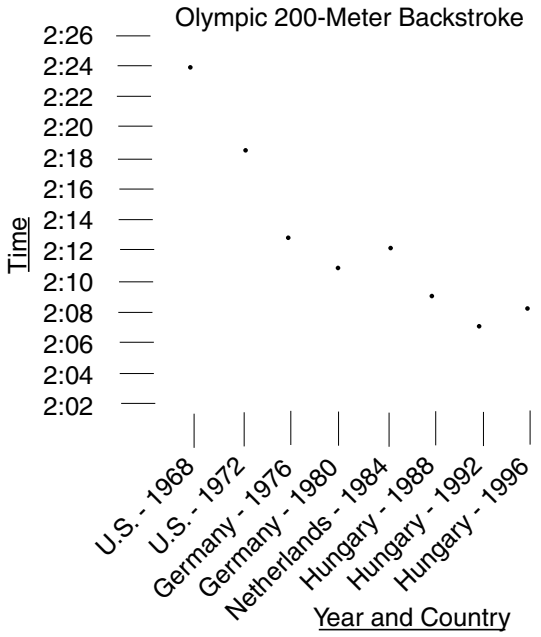
Overall, the student earns 4 points, demonstrating a strong understanding of graphing and the relationship between different representations of data (i.e., tables and graphs), as well as a strong ability to use the different representations of data to make a prediction.

ANNOTATED STUDENT RESPONSE
Grade 8 Mathematics

Sample Student Response Scored a 3

Student Response

A.



B. This graph of the Olympic 200 meter Backstroke over time shows a negative correlation, meaning that the more recent of a race usually better the time.

C. By the 2,000 Olympics and reasonable time for this race would be 2:06, because the last two times have been 2:07 & 2:08. 2:06 is pretty close because since the times times are getting better is is harded to decrease the time in the past Olympics.

← Student correctly graphs the numeric data. Graph is correctly formatted (scales and labels) and all points are correctly plotted. (2 points)

← Student correctly describes the trend as a negative correlation, explaining that "the more recent of a race usually better the time"). (1 point)

← Student correctly predicts a reasonable winning time of 2:06 and offers an explanation in support of the prediction, but the explanation is limited. (.5 point)

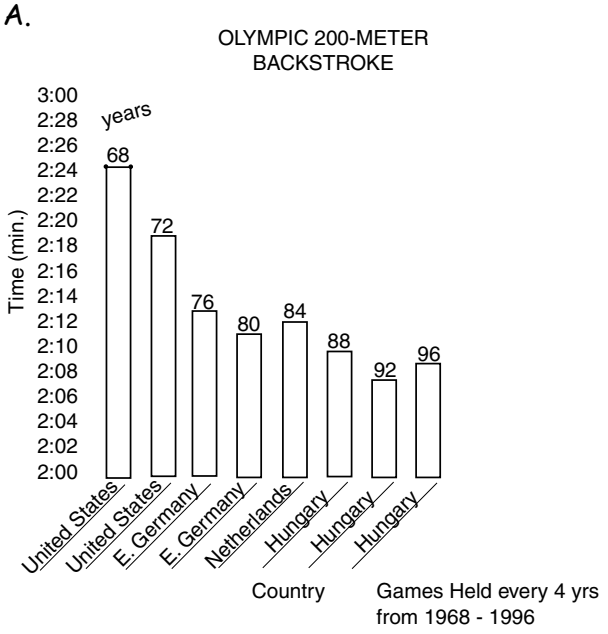
Overall, the student earns 3.5 points, demonstrating a general understanding of graphing and the relationship between different representations of data (i.e., tables and graphs), as well as a general ability to use the different representations of data to make a prediction.

ANNOTATED STUDENT RESPONSE
Grade 8 Mathematics

Sample Student Response Scored a 2

Student Response

A.



B. The trend that is displayed by the graph is that it shows the yrs. in order and it shows the decrease of the backstroke from 1968 - 1996.

C. In year 2000 I predict that womens 200-meter backstrokes winning time will be around 2 minutes and 6 seconds.

← Student graphs the numeric data using a bar graph, but the graph is only partially correct (i.e., the label for the x-axis does not show the word "year"). (1 point)

← Student describes the trend by stating that "it shows the yrs. in order and it shows the decrease of the backstroke from 1968 - 1996," which is not completely correct. (.5 point)

← Student correctly predicts a reasonable winning time of "2 minutes and 6 seconds," but offers no support for the prediction. (.5 point).

Overall, the student earns 2 points, demonstrating some understanding of graphing and the relationship between different representations of data (i.e., tables and graphs), as well as some ability to use the different representations of data to make a prediction.

ANNOTATED STUDENT RESPONSE
Grade 8 Mathematics

Sample Student Response Scored a 1

Student Response

Olympic 200-Meter Backstroke

Year	Time	Country
1968	2:24	USA
1972	2:19	USA
1976	2:13	E. Germany
1980	2:11	E. Germany
1984	2:12	Netherlands
1988	2:09	Hungary
1992	2:07	Hungary
1996	2:08	Hungary

B.) The pattern in the graph is that as the years go by the swimmers times get faster. Their is a 16 second time difference from 1968-1996

C.) In the year 2000 I think that the time will be 2:07 because for the last 12 years it has only been a second difference.

← Student recopies the chart instead of graphing the numeric data. (0 points)

← Student describes the trend by stating that "as the years go by the swimmers times get faster," which is not completely correct. (.5 point)

← Student correctly predicts a reasonable winning time of 2:07 and attempts to provide support for the prediction (i.e., "for the last 12 years it has only been a second difference"), but the support is incorrect. (.5 point)

Overall, the student earns 1 point, demonstrating a minimal ability to use a table of data to make a prediction.

INSTRUCTIONAL STRATEGIES
Grade 8 Mathematics

The open-response item "**Olympic 200-Meter Times**" was designed to address students' ability to graph information from a table, to describe the trend shown on the graph, and to make a reasonable prediction based on the trend. The instructional strategies below present ideas for helping students explore and master these skills.

Review the components of a graph and how to format it, including determining the scale and labeling the axes.

Review the types of graphs, including bar graphs, line graphs, line plots, scatter plots, and circle graphs, and the appropriateness of using them for particular purposes.

Discuss how using real-world examples of data rather than contrived data can affect graphs.

Discuss the importance of using increments in the scale and how ignoring this can distort the graph ("increments" implies a standard magnitude between each "tic" of the graph).

Provide opportunities for students to work individually, in pairs, in small groups, and/or as a class to complete (with teacher guidance and support) any or all of the following activities:

- Graph data of different types, with no particular order or intervals.
- Organize varied information using tables, graphs, or charts to solve problems.
- Describe what the graphs show.
- Make predictions from the graphs.
- Discuss the reasonableness of the predictions from the graphs.
- Compare the predictions to real follow-up data to verify the quality of their predictions.

  Example: Give students the Olympic data from 1956-1980 and ask, "What do you think the record times were from 1980 to 1996?" After they predict and discuss reasonableness, THEN hand them the rest of the data to VERIFY the quality of their predictions.